

Hybrid Rocket Motor Technology

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MSFC is preparing to test a new rocket motor that will combine the safety features of a liquid-propulsion system with the cost savings of a solid-propulsion system to achieve a full-scale, 250,000-pound-thrust hybrid rocket motor. It will be designed, fabricated, and tested under a multipartner effort called the Hybrid Propulsion Demonstration Program. Developmental testing will be performed at MSFC's test stand 500 beginning in December 1996.

The goal of the program is to demonstrate critical hybrid-propulsion technologies and enable manufacturing of large hybrid boosters for current and future space launch vehicles. Preliminary concepts show promise for application on both the X-33 Advanced Technology Demonstrator and the Atlas launch vehicle. The hybrid motors can be used independently, such as for sounding rockets, or for thrust augmentation on an expendable or reusable launch vehicle.

Safety, the most critical factor for any propulsion system, is the key feature of the hybrid rocket motor: hybrid motors employ an inert solid fuel and a liquid oxidizer which are physically separated until ignition. The motor throttle can be controlled to enable on-pad checkout, thrust tailoring, and abort options.

MSFC's role will include providing test facilities, test operations support, and test analysis. Modifications to test stand 500 are being made to accommodate motor development, including expansions in the feed, ignition, pressurization, and purge systems.

The Hybrid Propulsion Demonstration Program is an excellent example of partnership between government and industry participants working together to enhance and mature technologies for future applications. The effort combines the resources and funding of NASA; the Advanced Research Project Agency in Washington, D.C.; Phillips Laboratory at Edwards Air-Force Base, California; and members of an industry consortium that includes Lockheed Martin, Thiokol Corporation, United Technologies, the Rocketdyne Division of Rockwell International, Allied Signal, and Environmental Aerosciences.

Sponsor: Office of Commercial Development and Technology Transfer

Industry Involvement: Lockheed Martin, Thiokol Corporation, United Technologies, the Rocketdyne Division of Rockwell International, Allied Signal, Environmental Aerosciences

Other Government Involvement: Advanced Research Project Agency, Washington, D.C.; Phillips Laboratory, Edwards Air Force Base, California

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